TOSHIBA

MOTOR PROTECTION RELAY

MODEL S2E21

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TOSHIBA MODEL S2E21

TOSHIBA'S motor protection relay, Model S2E21, is a total motor protection and monitoring package for all motor applications. It has all the protective features necessary, including a display of running event data.

FEATURES

1. TEMPERATURE SIMILATION FOR OVERLOAD

Every motor application is protected by temperature similation used for overload protection.

2. SIMPLE OPERATION

Relay programming is made simple by clear, easy to follow instructions, large LCD display with integral programmer, or by computer.

3. ALL TYPES OF PROTECTION

Thermal overload, instantaneous overcurrent, overcurrent, current unbalance, undercurrent, locked rotor, repeated starting and ground fault.

4. MAINTENANCE DATA

Rotor and stator temperatures, number of starts, running time, history of key parameters before trip, running event data.

5. MONITORING SYSTEM

Built-in memory card supports on-going maintenance procedures.

6. COMMUNICATIONS

Standard RS485 communication port is standard for all relays.

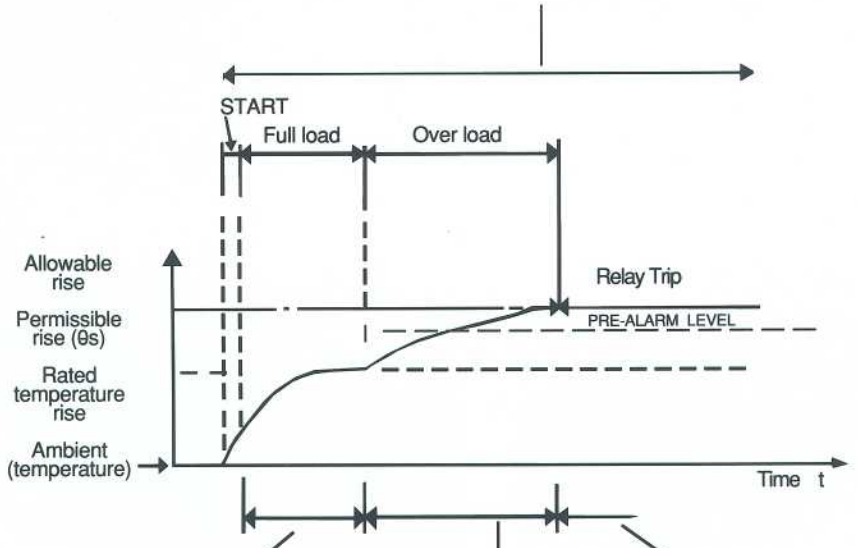
PROTECTIVE FUNCTIONS

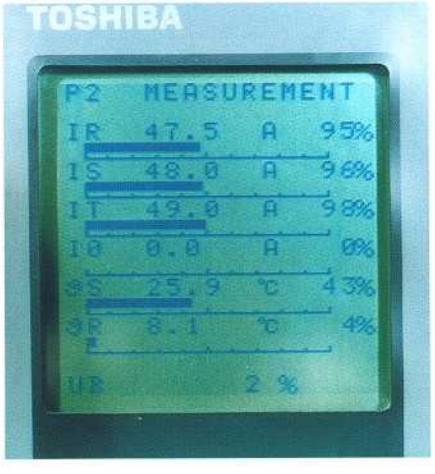
Feature	Device No.
Overload	49
Short Circuit - Instantaneous Overcurrent	50
Overcurrent	51
Current Phase Unbalance	46
Stator and/or Bearing Overtemperature	38/49
Undercurrent	37
Zero Sequence Ground Fault	50G/51G
Locked Rotor and Starting Time Failure	48
Repeated Starting	66
Two Auxiliary Inputs for External Fault Relays	

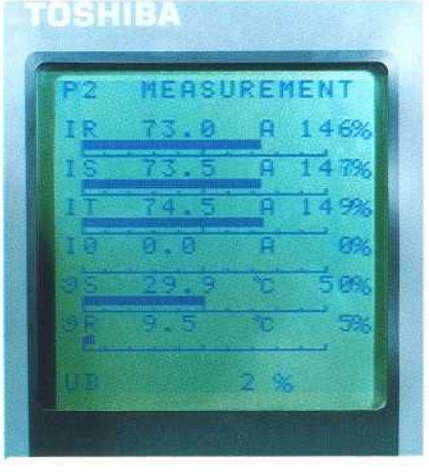
RATINGS

ITEMS		DESCRIPTION
Control power supply		AC 100V - 120V DC 100V - 125V
Rated frequency		50/60 Hz
Rated current		1A/5A (CT secondary current)
Applicable environment	Ambient temp.	-10 to +60°C -20 to +60°C (in storage and transportation)
	Humidity	20 to 85% RH (no condensation)
	Altitude	2000m (6600ft) max.
Performance	Dielectric strength	AC 2000V, for 1 min.
	Current withstand	1.3 x rated current continuously. 40 x rated current for 1 sec.
	Vibration withstand	16.7 Hz, total amplitude 3mm (3 directions, 2 hours)
	Shock withstand	10G (3 directions, 2 hours)
Output Contact		TRIP 1C (FAIL-SAFE/NON-FAIL-SAFE) LOCK 1C (FAIL-SAFE/NON-FAIL-SAFE) ALARM 1C (FAIL-SAFE/NON-FAIL-SAFE) ERROR 1C (FAIL-SAFE/NON-FAIL-SAFE)

APPLICATION







OPERATION

Simple, straightforward operation.

Standard relay is drawout construction. CT connections are shorted automatically when relay is drawn out.

Memory card is included as a standard accessory.

Power Indicator (green)

Running Monitor (red)

Stop - Light is off
Run - Light is on (steady)
Starting - Light blinks in 1 second intervals

Overload Detection

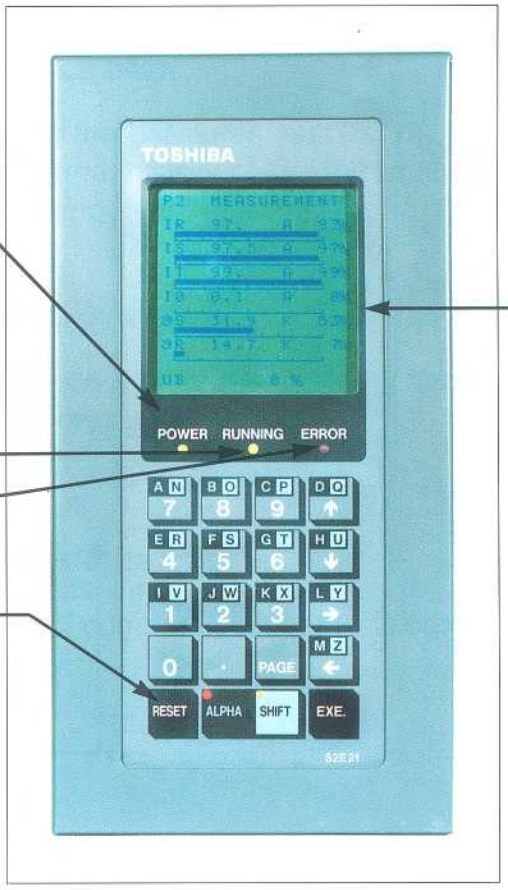
Light blinks 3 times/second

Error Indicator (red)

Lighted when relay detects self-checking error

Trip Indicator (yellow)

Lighted when any protective function causes relay to trip. LCD display will show what type of trip occurred.



TERMINAL BLOCKS	MEMORY CARD	DRAW OUT

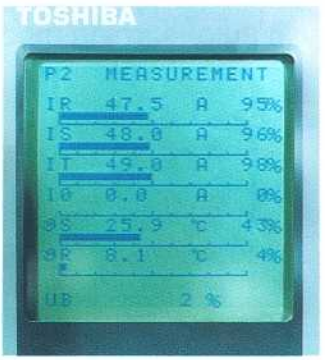
LCD DISPLAY OPERATION

Each information cell is assigned a separate page display. Selecting the page to view the desired display is performed by pressing 'Page' and then either the page number or the Up or Down cursor key.

Auto-shutoff feature. LCD display is turned off automatically if no new LCD screen is selected within 4 minutes.

Set points are protected by PASSWORD ID security feature. Settings may be viewed, but not changed, except by personnel authorized with the correct password.

LCD DISPLAY SAMPLES



Function		Display Page	Description		
INDICATION	Ammeter	P2	Range	Three Phase 0.05-17 x CT	Zero Function 0.005-1.7 x ZCT
			Accuracy	+2.5% at CT & ZCT Rating	
			Updated	0.5 sec	
	Calculated temperature rise (stator, rotor)	P2	Digital and analog bar.		
	Unbalanced ratio	P2	2 digits		
	RTD temperature	P3	3 digits, 8 channel Type: Pt 100 ohm, Pt 100 ohm (JIS), Ni 100 ohm, Ni 120 ohm Range: -20 to 200°C, 1°C step Length: 1000 m (3300ft)		
	3 Phase starting current	P4	IRst ISst ITst	Starting current of last start	
	Average starting current	P4	Ist	Average value of last 5 starts	
	Starting time	P4	Tst	Starting time of last start	
	Average starting time	P4	TAVst	Average value of last 5 starts	

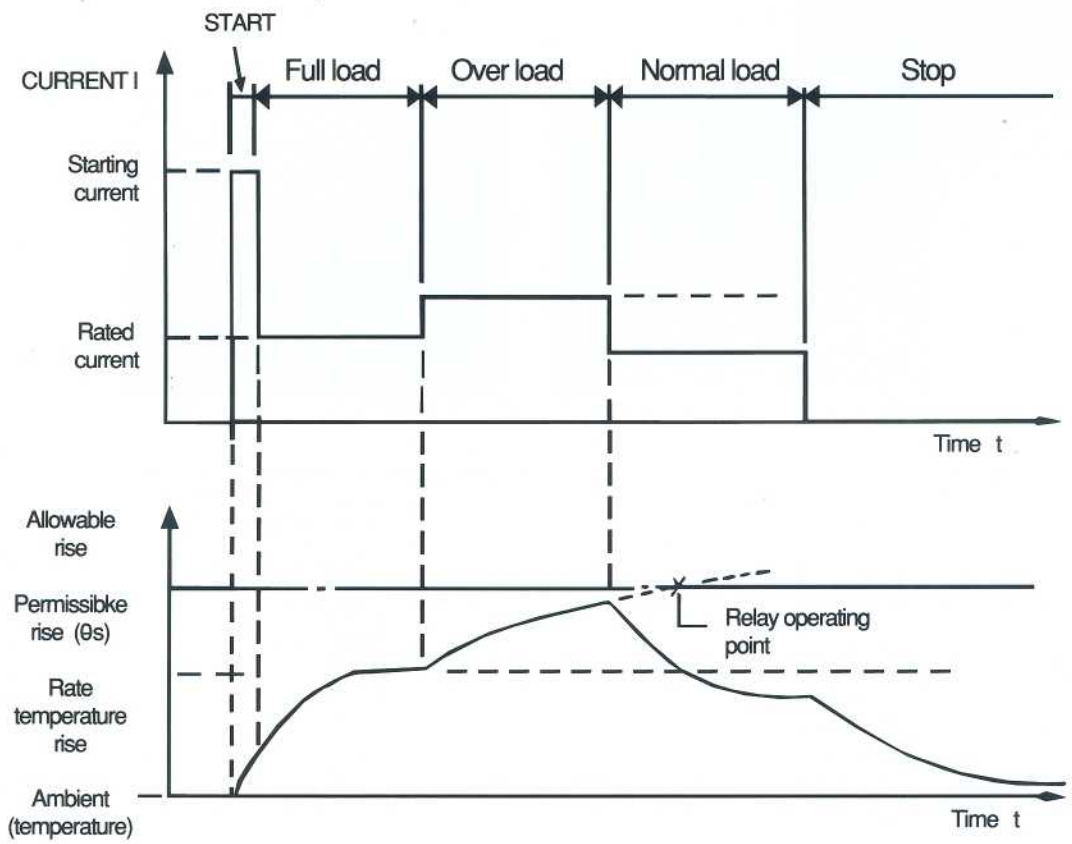
Function		Display Page	Code	Description
INDICATION	Running Time	P4	Trun	Running Time of last start
	Maximum current value	P4	IMAX	Maximum current value monitored
	Start counter	P4	Nst	Counter to count the number of starts
	Total running time	P4	Ttrun	Total running time of motor
	Event display	P10	–	Displays last 14 events
	Daily start counter	P5	–	Start counter for last 14 days of operation
	Maximum starts day	P6	–	Day and number starts of maximum starts (highest 3 days)
	Trip data	P50 P51	–	Data display at trip
	Current trend	P52 P53	–	Current value display 1 to 10 sec. before trip
	Machine ID	P0	MACH ID	Individual code of S2E21 or motor
	Date/Time	P0	–	DATE and TIME

PROTECTION

Overload protection, locked rotor protection, and repeat start protection are accomplished by a scientific calculation performed by the relay, simulating real-world temperatures.

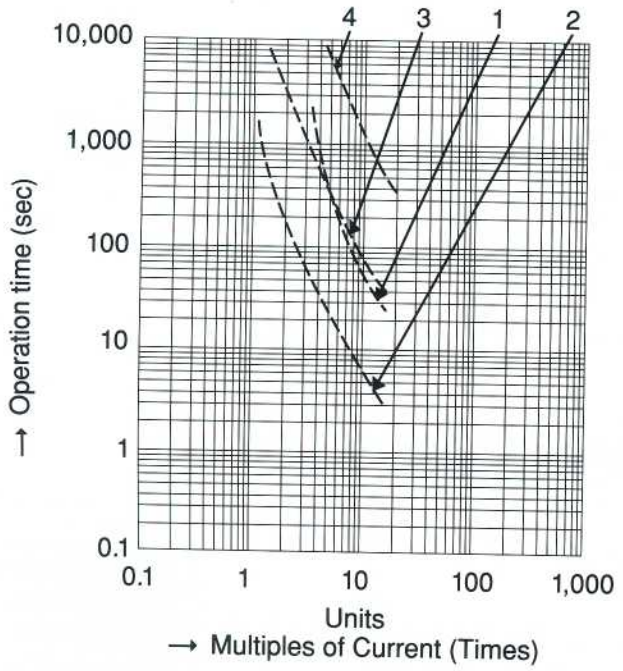
The temperature simulation protection method calculates the rotor and stator heat rise based on measured line currents, the motor thermal heating time constant, and the motor cooling time constant. These values are constantly monitored by the relay and compared to the set trip points. This method offers complete protection for all motor applications.

If RTD's are present in the motor the auto-learning function will allow the relay to read the actual heating and cooling time constant of any type of motor, eliminating the need for programming the heating and cooling time constants by an operator. Starting currents and acceleration time may also be calculated by the relay in auto-learning mode.

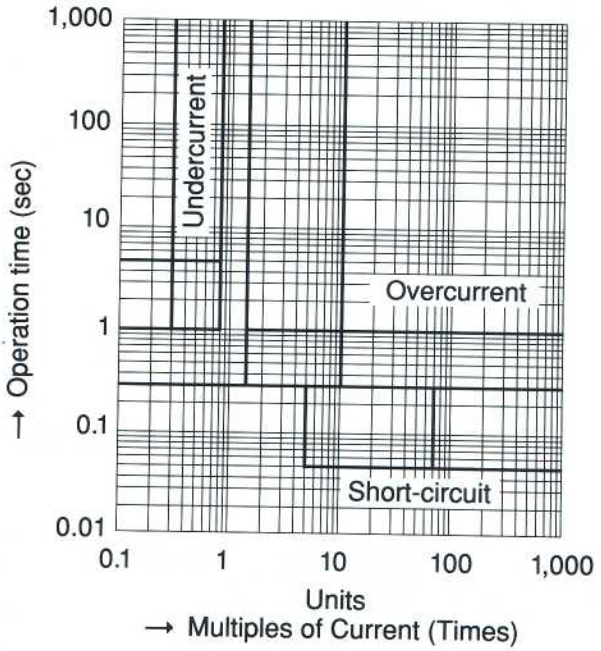


Function		Description	
PROTECTION	Overload	Rated current:	2A - 2000A
		Heat time constant:	10 - 165 Min.
		Cooling time constant:	10 - 500 Min.
		Allowable temperature rise of stator:	60 - 125°C
	Instantaneous Over current	Operating current:	5 - 17 x Rated current ± 15%
		Operating time:	50ms or less
	Overcurrent	Operating current:	1.5 - 10 x Rated current ± 5%
		Operating time:	0.3 - 1 Sec.
	Phase unbalance	Operating current: (Minimum)	0.5 x Rated current ± 10% (3Ø Average)
		Unbalance ratio:	5 - 30%
		Operating time:	4 sec. of less
	Under current	Operating current:	0.3 - 0.8 x Rated current ± 10%
		Operating time:	1 - 5 sec. ± 10%
	Ground fault	Operating current:	0.05 - .40 x ZCT Pri.Rating ± 10%
		Operating time:	0.1 - 1.5 sec.
			0.1 sec.: + 40% - 0%
			Others: ± 20%
	Locked rotor	Starting current set:	1.5 - 15 x Rated current
		Starting time set:	1 - 60 sec.
		Allowable locked rotor time:	1 - 130 sec.
	Repeated start	Automatically calculated based on motor operation history, present conditions and thermal capability of motor.	
	External fault input	2 external fault input ports	

Overload Curve Examples



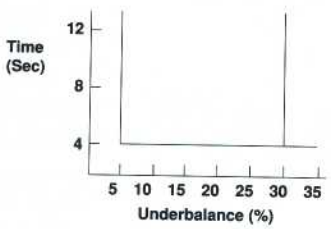
Short-circuit, Overcurrent, and Undercurrent



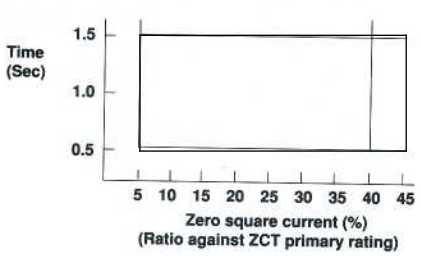
Overload Curve Examples

Curve No.	Heating time constant (min)	Allowable temperature rise (°C)	Rated temperature rise (°C)
1	10	125	10
2	10	125	100
3	165	125	10
4	165	125	100

Unbalance Curve



Ground Fault Curve



SET POINT LIST

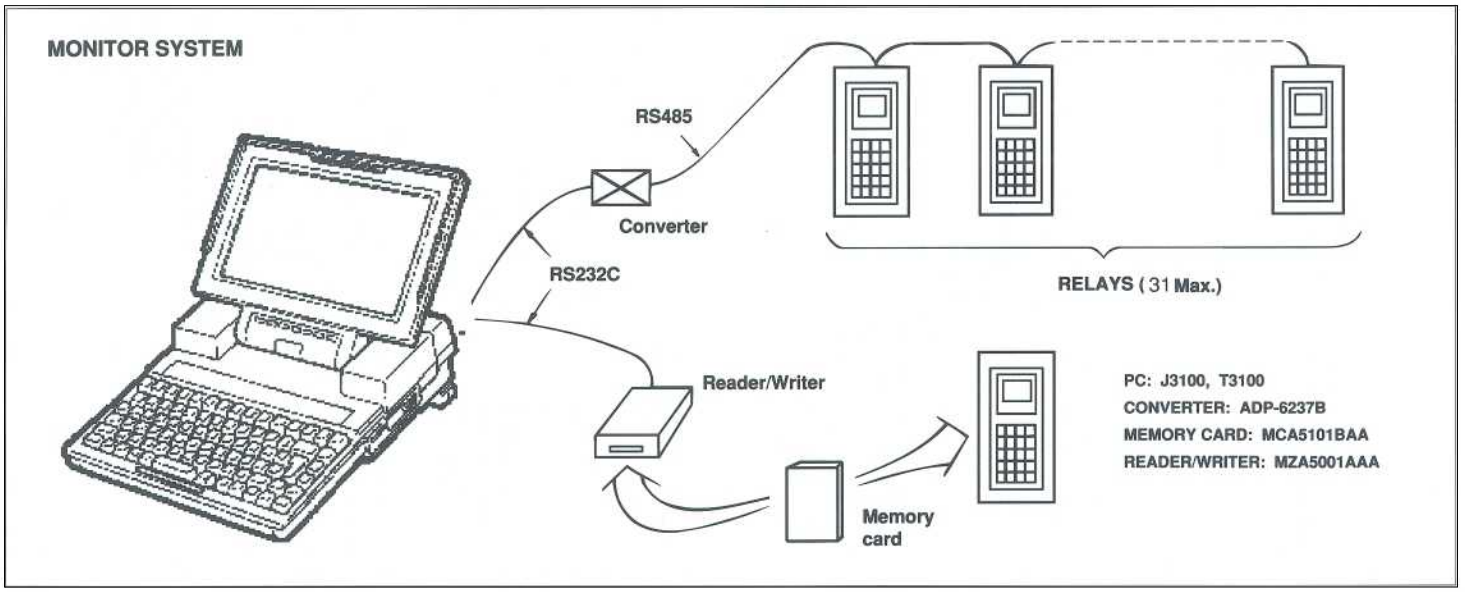
	Item	Page	Code	Value	Factory Set Point
Set Point	CT rating	P20	CT	5 - 2000 A	5A
	ZCT rating	P20	ZCT	50 - 100 A	50A
	Rated current	P20	IN	40 - 100%	40%
	Heating time constant of stator	P21	TR	10 - 165 MIN	10 MIN
	Cooling time constant of stator	P21	TD	10 - 500 MIN	10 MIN
	Allowable stator temperature rise	P21	θSM	60 - 125 DEG (RISE)	60 C
	Rated stator temperature rise	P21	θSN	10 - 125 DEG (RISE)	50 C
	INST operating current	P22	I INST	5 - 17 x IN	0 (OFF)
	OC operating current	P22	IOC	1.5 - 10 x IN	0 (OFF)
	OC operating time	P22	TOC	0.3 - 1 SEC	0.3 SEC
	Unbalance ratio	P23	UB	5 - 30%	0 (OFF)
	UC operating current	P23	IUC	30 - 80% x IN	0(OFF)
	UC operating time	P23	TUC	1 - 5 SEC	1 SEC
	G.F. operating current	P24	IOCG	5 - 40% x ZCT	0 (OFF)
	G.F. operating time	P24	TOCG	0.1 - 1.5 SEC	0.1 SEC
	Allowable locked rotor time in COLD condition	P25	TSC	1 - 130 SEC	0(OFF)
	Starting current	P25	IST	1.5 - 15 x IN	6 times IN
	Starting time	P25	TST	1 - 60 SEC	1 SEC
	Data communication	P26	–	Slave No.: 1 - 31 Parity: None, Even Remote set: No/Yes	1 0 (NONE) 0 (NO)
	Memory card	P27	–		
	Alarm, reset level	P28 P33	– –	–	–
	Output configuration	P29 P30	– –	Output selection fail-safe/non-fail-safe	OL Trip non-fail-safe
	Analog output	P31	ATD	Output selection	0 (NONE)
	RTD	P32	RTD1-8	RTD selection	0 (NONE)
	Auto-learning	P34	P34	IST: Tst: Off/On TR: TD:	OFF

ORDERING INFORMATION

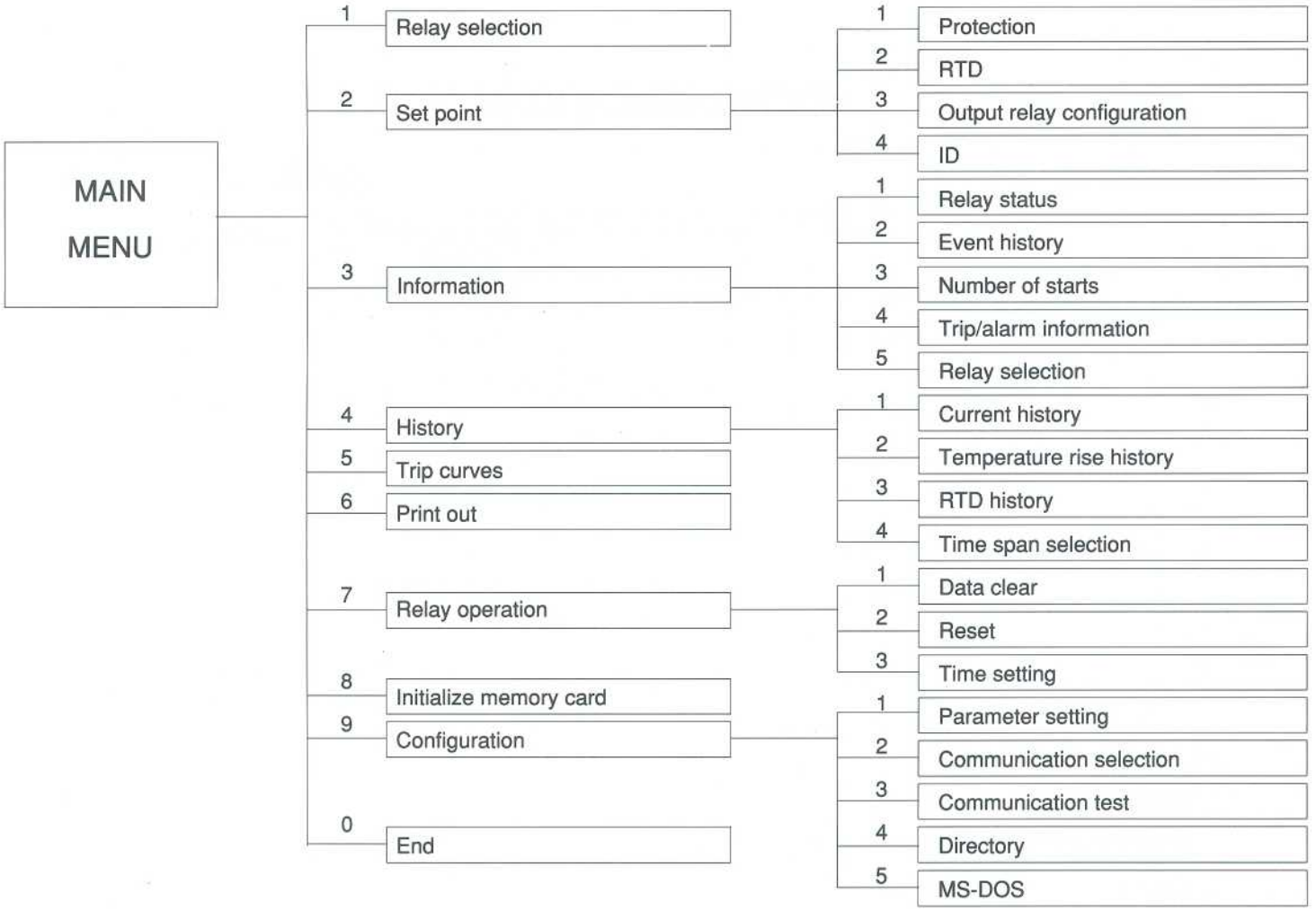
Description	Order Code	Model No.	Function	Accessory Items
Motor protection relay	S2E21 - C1A		Standard	Memory card (Qty 1)
Motor protection relay	S2E21 - C1AA		With DG for ungrounded system 50Hz	Memory card (Qty 1)
Motor protection relay	S2E21 - C1AB		With DG for ungrounded system 60Hz	Test plug for DDG (Qty 1)
Motor protection relay	S2E21 - C1AC		With DG for 10A grounded system 60Hz	
Motor protection relay	S2E21 - C1AD		With DG for 10A grounded system 50Hz	
Motor protection relay	S2E21 - C1AE		With DG of capacitory voltage division type 50Hz	
Motor protection relay	S2E21 - C1AF		With DG of capacitory voltage division type 60Hz	
Monitor software	S2E21 - SE		3.5 inch 2HD FDD	Quantity 1
Converter	4D9E0054GOO2	ADP-6237B	Necessary, when data communication (RS485) used	Cable (Qty 1)
Memory card Reader./Writer	4D9E0054GOO1	MZA5001AAA	Necessary, when memory card used in programming from computer	Cable (Qty 1)
Memory card	4D9E0057GOO1	MCA5101BAA	S-RAM, 32-kbyte, 40 pin	

MONITOR SYSTEM

TOSHIBA'S monitor system can be used to plan and implement a motor maintenance program.

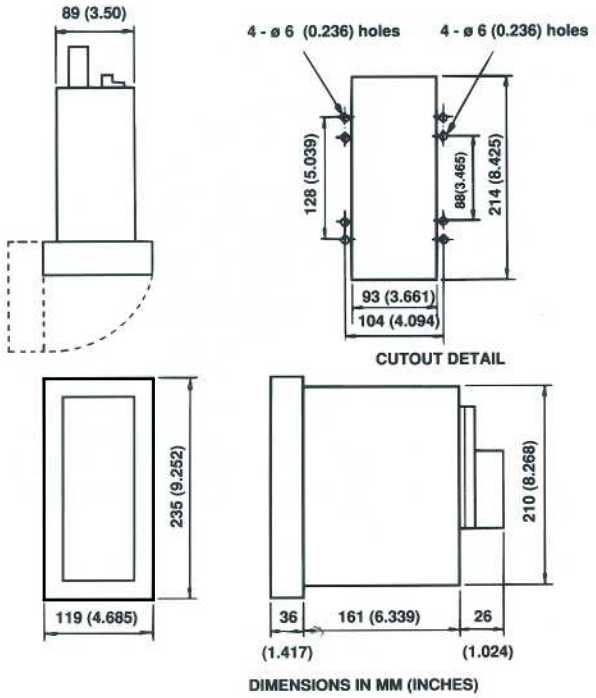


Easy operation. All items are selected from the menu.

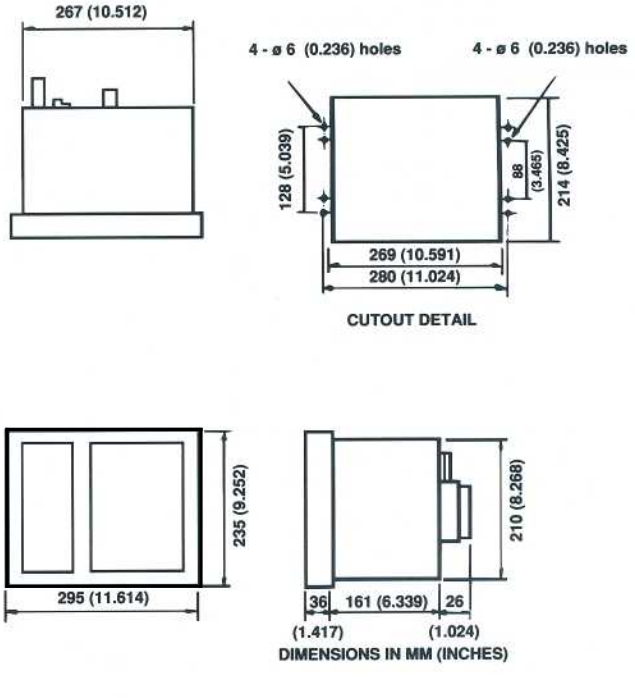


DIMENSIONS

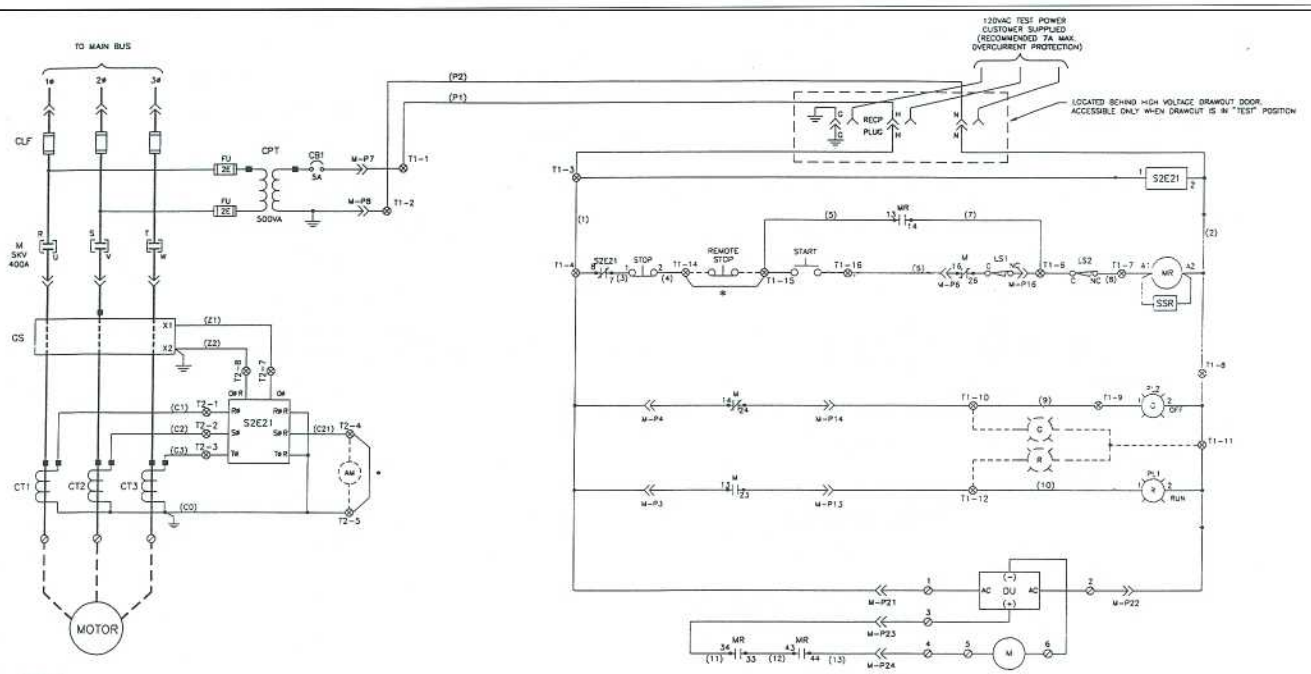
External Dimensions of S2E21-C1A* (without DG)



External Dimensions of S2E21-C1A [ ] (with DG)



CONNECTION



NOTES

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L-A-001-97

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Printed in U.S.A.